Advanced Analysis

1b. Given weather charts and HO-301, analyze for low-level features within two hours as determined by a master solution.

Basic Analysis Techniques

- Isopleths
  - Height and temperature are analyzed the same as they were in objective a.
    - Isobars
      - Isopleths of pressure on a constant height chart are called isobars.

Basic Analysis Techniques

- Isobars are drawn as solid black lines using an interval of 4 mb with a base of 1000 mb
  - » Open isobars are labeled at each end of the isobar.
  - » Closed isobars are labeled at the top center of the isobar.
  - » When labeling isobars, omit the leading “9” or “10”. The 1012 mb isobar is labeled “12” and the 996 mb isobar is labeled “96”.

Basic Analysis Techniques

- Isobars on the surface chart have the same relationship to the wind field as contours on upper-level charts.

- The only difference is that at the surface, allowances must be made for cross isobaric flow due to friction.

  - » The winds will cross isobars from high to low pressure.
  - » This effect is greatest over rough terrain.

Basic Analysis Techniques

- Atmospheric Features
  - Pressure/Height Centers
    - Height centers on the 850 mb chart are analyzed and labeled the same as on upper level, constant pressure charts.
    - Pressure centers on the surface chart are classified and depicted in the following manner:
      - The central value is labeled using whole millibars. The central pressure is underlined (1027).

Basic Analysis Techniques

- Use the surface winds to help estimate the central pressure in the same way described for determining central height in Analysis I.

Basic Analysis Techniques

- Trough and Ridge Axes
  - At 850 mb, indicate trough and ridge axes using the same notation as in Analysis I.
  - Surface trough axes are depicted using the same notation as at upper levels. **Surface ridge axes are not depicted**.

- 850 mb warm and cold pockets are analyzed the same as in objective a.

Basic Analysis Techniques

- Fronts and Upper Fronts
  - Depiction
    - Cold Fronts
      - » Surface cold fronts are depicted as a solid blue line with solid blue triangles pointing in the direction the front is moving.
      - » Upper cold fronts are depicted as a solid blue line with open blue triangles pointing in the direction the front is moving.

- Cold fronts undergoing frontogenesis are depicted as above, only a dot is inserted between each triangle as shown below.
- Cold fronts undergoing frontolysis are depicted as above, only a short line with a slash through it is inserted between each triangle as shown below.

Basic Analysis Techniques

- Warm Fronts
  - » Surface warm fronts are depicted as a solid red line with solid red half circles pointing in the direction the front is moving.
  - » Upper warm fronts are depicted as a solid red line with open red half circles pointing in the direction the front is moving.

Basic Analysis Techniques

» Warm fronts undergoing frontogenesis are depicted as above, only a dot is inserted between each half-circle as shown below.

» Warm fronts undergoing frontolysis are depicted as above, only a short line with a slash through it is inserted between each half-circle as shown below.

Basic Analysis Techniques

- Stationary Fronts
  - » Surface stationary fronts are depicted as an alternating solid red and blue line with alternating solid red half-circles and blue triangles on opposite sides of the front.
  - » Upper stationary fronts are depicted as an alternating solid red and blue line with alternating open red half-circles and blue triangles on opposite sides of the front.

Basic Analysis Techniques

- Stationary fronts undergoing frontogenesis are depicted as above, only a dot is inserted between each set of pips as shown below.

- Warm fronts undergoing frontolysis are depicted as above, only a short line with a slash through it is inserted between each set of pips as shown below.

Basic Analysis Techniques

- Placement
  - Use the frontal placement from your thickness chart as the first guess at frontal position. Refine your placement based on surface and 850 mb data.
  - Use the frontal placement indicators describe in Dynamics.

Basic Analysis Techniques

- Occlusions
  - Depiction
    - Surface occlusions are depicted as a solid purple line with alternating solid purple half-circles and triangles pointing in the direction the occlusion is moving.
    - Upper occlusions are depicted as a solid purple line with alternating open purple half-circles and triangles pointing in the direction the occlusion is moving.
    - Occlusions undergoing frontolysis are depicted as above, only a short line with a slash through it is inserted between each set of pips as shown below.

Basic Analysis Techniques

- Placement
  - Cold type occlusions are located along the thi ckness/thermal ridge axis
    .
  - Warm type occlusions are located behind the t hickness/thermal ridge axis
    .

Basic Analysis Techniques

- Weather - Each weather symbol is enhanced and shaded according to the conventions detailed in the visual aid handout.

Basic Analysis Techniques

- Air Masses
  - Air masses are classified using the terminology taught in Climatology.
  - Each air mass is given an identifier of the form “xYz”where…
    - “x” is the moisture identifier.
      - » Moist (maritime) air is designated with an “m”.
      - » Dry (continental) air is designated with a “c”.

Basic Analysis Techniques

- "Y" is the temperature identifier.
  - » Cold (polar) air is designated with a "P".
  - » Warm (tropical) air is designated with a "T".

Basic Analysis Techniques

- "z" is the low-level stability identifier. This is only used if the air mass has moved outside of its source region.
  - » Air which is colder than the overlying surface and is unstable air is designated with a "k".
  - » Air which is warmer than the overlying surface is stable and designated with a "w".

Basic Analysis Techniques

- Modification
  - An air mass is considered “modified” when the following criteria are met.
    - » Its characteristics have changed and it no longer is accurately described by the previous classification.
    - » It has not yet taken on the characteristics of a new classification.

Basic Analysis Techniques

- The “modified” identifier should be thought of as a “last resort”.
  - » It is used ONLY if the air mass cannot be reasonably classified as one of the primary types.
  - » This convention of labeling air masses modified on surface charts is for school purposes only.

Basic Analysis Techniques

- Examples
  - Cold, dry air in central Canada is classified as continental polar. Since it is in its source region it does not have a low-level stability indicator. The air mass is labeled “cP”.
  - Warm, moist air moving northward off the Gulf of Mexico over cool ground is classified as maritime tropical. Since it is warmer than the ground it is labeled “mTw”.
  - Continental polar air has moved down into the Gulf States. It is now quite warm but still dry. This air mass is a modified continental polar air mass. It is still cooler than the overlying surface. This air mass would be labeled “mod cPk”.

Basic Analysis Techniques

- Continuity
  - Plot the position of weather features 12 hours earlier using a yellow marker or highlighter.
  - Continuity is kept on the following features:
    - Low- and High-Height/Pressure Center Position and Intensity
    - Ridge and Trough Position
    - Front and Upper Front Position

Chart Preparation

- 850 mb Chart Preparation
  - Trace the past position of features on your chart (Continuity).
  - Analyze height contours every 3 dam from a base of 150 dam.
  - Locate and label high and low height centers.
  - Analyze the temperature field using 5°C isotherms.
  - Locate and label warm and cold pockets.

Chart Preparation

- Analyze areas of moisture.
- Locate and label trough and ridge axes.
- Locate and label upper fronts.

Chart Preparation

- Surface Chart Preparation
  - Trace the past position of features on your chart (Continuity).
  - Trace the current position of the polar front jet on the surface chart in orange. (school requirement only)
  - Analyze the surface pressure field by drawing isobars.
  - Locate and label high and low pressure centers.

Chart Preparation

- Locate and label surface fronts.
- Analyze areas of weather
- Locate and label trough axes.
- Identify and label air masses.

– APPLICATION: Students will practice what they have learned by analyzing the March 1993 chart set. As students learn to analyze the low levels, be sure to stress the relationship to the upper-level features depicted on the 300 mb, 500 mb, and 700 mb charts analyzed in objective a. Also, show students how the thickness and vorticity charts analyzed in Blocks I and II are useful when analyzing low levels.

- EVALUATION: Administer the progress check. The progress check consists of the surface chart from 12Z/13 March 1993.